Bridge to Higher Math
D Term 2011
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MA197X Problem Set 2

Instructions: Please review the rules on the presentation of assignments in the course. Then complete the following ten problems and submit the solutions, inside your portfolio folder, by Wednesday, March 30th.

For each of the following problems, first state the problem precisely in English and then give a proper proof of the statement using English sentences. Be sure to include the correct problem numbers for recording purposes.

7. *(Distributive Law)* For all sets A, B and C, $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.
8. *(Distributive Law)* For all sets A, B and C, $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.
9. For all sets A, B and C, if $A \subseteq B$ and $A \subseteq C$, then $A \subseteq B \cap C$.
10. For all sets A, B and C, $C - (A \cup B) = (C - A) \cap (C - B)$.
11. For all sets A, B and C, if $(A \cap B) \cup C \subseteq A \cap (B \cup C)$, then $C \subseteq A$.
12. For all sets A, B and C, $(A - B) - C = A - (B - C)$ if and only if $A \cap C = \emptyset$.
13. For all sets A, B and C, if $A \cap C \subseteq B \cap C$ and $A \cup C \subseteq B \cup C$, then $A \subseteq B$. *[HINT: Consider two cases.]*
14. State and prove DeMorgan's Laws (#14 and #15 on p38 in the text – call these part (a) and part (b), respectively).
15. TRUE or FALSE?: For all closed intervals $[a, b]$ and $[c, d]$ on the real number line, if $[a, b] \cap [c, d]$ is empty, then $d < a$ or $c > b$. *(If TRUE, prove it; if FALSE, provide a counterexample, with explanation.)*

16. Each of the following statements is false. For each, first write the statement, then write the negation of the statement in English and then provide a counterexample, with a brief explanation.

(a) For all sets A and B, $A \cup B = (A - B) \cup (B - A)$.

(b) For all sets A and B, $A \cap B \neq A - B$.

(c) For all sets A and B, if $A \cup B = A$, then $B = \emptyset$.

(d) For all sets A, B and C, $A \cap (B \cup C) = (A \cap B) \cup C$.